

# ORDINANCE APPENDIX A

## STANDARD STORMWATER FACILITIES MAINTENANCE AND MONITORING

### AGREEMENT

THIS AGREEMENT, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, by and between \_\_\_\_\_, (hereinafter the "Landowner"), and \_\_\_\_\_ [Municipal Name] \_\_\_\_\_, [County Name] County; Pennsylvania, (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of [County Name] County, Pennsylvania, Deed Book \_\_\_\_\_ at Page \_\_\_\_\_, (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the Subdivision/Land Management Plan (hereinafter "Plan") for the \_\_\_\_\_ Subdivision which is expressly made a part hereof, as approved or to be approved by the Municipality, provides for detention or retention of stormwater within the confines of the Property; and

WHEREAS, the Municipality and the Landowner, his successors and assigns agree that the health, safety, and welfare of the residents of the Municipality require that on-site stormwater management facilities be constructed and maintained on the Property; and

**WHEREAS, the Municipality requires, through the implementation of the \_\_\_\_\_ Watershed Stormwater Management Plan, that stormwater management facilities as shown on the Plan be constructed and adequately maintained by the Landowner, his successors and assigns.**

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The on-site stormwater management facilities shall be constructed by the Landowner, his successors and assigns, in accordance with the terms, conditions and specifications identified in the Plan.
2. The Landowner, his successors and assigns, shall maintain the stormwater management facilities in good working condition, acceptable to the Municipality so that they are performing their design functions
3. The Landowner, his successors and assigns, hereby grants permission to the Municipality, his authorized agents and employees, upon presentation of proper identification, to enter upon the Property at reasonable times, and to inspect the stormwater management facilities whenever the Municipality deems necessary. The purpose of the

inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structures, pond areas, access roads, etc. When inspections are conducted, the Municipality shall give the Landowner, his successors and assigns, copies of the inspection report with findings and evaluations. At a minimum, maintenance inspections shall be performed in accordance with the following schedule:

- Annually for the first 5 years after the construction of the stormwater facilities,
  - Once every 2 years thereafter, or
  - During or immediately upon the cessation of a 100 year or greater precipitation event.
4. All reasonable costs for said inspections shall be born by the Landowner and payable to the Municipality.
  5. The owner shall convey to the municipality easements and/or rights-of-way to assure access for periodic inspections by the municipality and maintenance, if required.
  6. In the event the Landowner, his successors and assigns, fails to maintain the stormwater management facilities in good working condition acceptable to the Municipality, the Municipality may enter upon the Property and take such necessary and prudent action to maintain said stormwater management facilities and to charge the costs of the maintenance and/or repairs to the Landowner, his successors and assigns. This provision shall not be construed as to allow the Municipality to erect any structure of a permanent nature on the land of the Landowner, outside of any easement belonging to the Municipality. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.
  7. The Landowner, his successors and assigns, will perform maintenance in accordance with the maintenance schedule for the stormwater management facilities including sediment removal as outlined on the approved schedule and/or Subdivision/Land Development Plan.
  8. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like on account of the Landowner's or his successors' and assigns' failure to perform such work, the Landowner, his successors and assigns, shall reimburse the Municipality upon demand, within 30 days of receipt of invoice thereof, for all costs incurred by the Municipality hereunder. If not paid within said 30-day period, the Municipality may enter a lien against the property in the amount of such costs, or may proceed to recover his costs through proceedings in equity or at law as authorized under the provisions of the \_\_\_\_\_ Code.
  9. The Landowner, his successors and assigns, shall indemnify the Municipality and his agents and employees against any and all damages, accidents, casualties, occurrences or claims which might arise or be asserted against the Municipality for the construction, presence, existence or maintenance of the stormwater management facilities by the Landowner, his successors and assigns.
  10. In the event a claim is asserted against the Municipality, his agents or employees, the Municipality shall promptly notify the Landowner, his successors and assigns, and they shall defend, at their own expense, any suit based on such claim. If any judgment or claims against the Municipality, his agents or employees shall be allowed, the Landowner, his successors and assigns shall pay all costs and expenses in connection therewith.
  11. In the advent of an emergency or the occurrence of special or unusual circumstances or situations, the Municipality may enter the Property, if the Landowner is not immediately available, without notification or identification, to inspect and perform necessary maintenance and repairs, if needed, when the health, safety or welfare of the citizens is at jeopardy. However, the Municipality shall notify the landowner of any inspection, maintenance, or repair undertaken within 5 days of the activity. The Landowner shall reimburse the Municipality for his costs.

This Agreement shall be recorded among the land records of

\_\_\_\_\_[County Name]\_\_\_\_ County, Pennsylvania and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

\_\_\_\_\_

(SEAL)

For the Landowner:

\_\_\_\_\_

ATTEST:

\_\_\_\_\_ (City, Borough, Township)

County of \_\_\_\_\_ [County Name] \_\_\_\_\_, Pennsylvania

I, \_\_\_\_\_, a Notary Public in and for the County and State aforesaid, whose commission expires on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, do hereby certify that \_\_\_\_\_ whose name(s) is/are signed to the foregoing Agreement bearing date of the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, has acknowledged the same before me in my said County and State.

**GIVEN UNDER MY HAND THIS** \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_.

\_\_\_\_\_

**NOTARY PUBLIC**

(SEAL)

## **ORDINANCE APPENDIX B**

### **STORMWATER MANAGEMENT DESIGN CRITERIA**

#### **TABLE B-1**

##### **DESIGN STORM RAINFALL AMOUNT**

Source: "Field Manual of Pennsylvania Department of Transportation"  
STORM INTENSITY-DURATION-FREQUENCY CHARTS  
P D T - I D F May 1986.

#### **FIGURE B-1**

##### **SCS TYPE II RAINFALL DISTRIBUTION S-CURVE**

**FIGURE B-2**  
**PENNDOT DELINEATED REGIONS**  
Source: "Field Manual of Pennsylvania Department of Transportation"  
STORM INTENSITY-DURATION-FREQUENCY CHARTS  
P D T - I D F May 1986.

**FIGURE B-3**  
**REGION 4 PENNDOT STORM INTENSITY-DURATION-FREQUENCY CURVE**  
Source: "Field Manual of Pennsylvania Department of Transportation"  
STORM INTENSITY-DURATION-FREQUENCY CHARTS  
P D T - I D F May 1986.

**FIGURE B-4**  
**REGION 5 PENNDOT STORM INTENSITY-DURATION-FREQUENCY CURVE**  
Source: "Field Manual of Pennsylvania Department of Transportation"  
STORM INTENSITY-DURATION-FREQUENCY CHARTS  
P D T - I D F May 1986.

**TABLE B-2**  
**RUNOFF CURVE NUMBERS**  
Source: NRCS (SCS) TR-55

**TABLE B-3**  
**RATIONAL RUNOFF COEFFICIENTS**

**TABLE B-4**  
**MANNING ROUGHNESS COEFFICIENTS**

**TABLE B-5**  
**24-HOUR STORM VALUES REPRESENTING 90% OF ANNUAL RAINFALL**

**TABLE B-1**  
**DESIGN STORM RAINFALL AMOUNT (INCHES)**

The design storm rainfall amount chosen for design should be obtained from the PennDOT region in which the site is located according to Figure B-2.

Source: "Field Manual of Pennsylvania Department of Transportation"  
STORM INTENSITY-DURATION-FREQUENCY CHARTS  
P D T - I D F May 1986.

<b>Duration</b>	<b>Region 4</b>						
	<b>Precipitation Depth (in)</b>						
	1 Yr	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
5 min	0.30	0.35	0.41	0.45	0.50	0.55	0.61
15 min	0.58	0.68	0.80	0.93	1.03	1.13	1.25
1 hr	1.01	1.22	1.48	1.70	1.91	2.16	2.41
2 hrs	1.24	1.50	1.84	2.14	2.46	2.80	3.18
3 hrs	1.38	1.71	2.10	2.43	2.82	3.24	3.69
6 hrs	1.68	2.04	2.52	3.06	3.60	4.14	4.74
12 hrs	2.04	2.52	3.00	3.84	4.56	5.16	6.00
24 hrs	2.40	2.88	3.60	4.56	5.76	6.48	7.44

<b>Duration</b>	<b>Region 5</b>						
	<b>Precipitation Depth (in)</b>						
	1 Yr	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
5 min	0.33	0.38	0.45	0.50	0.56	0.63	0.68
15 min	0.64	0.75	0.90	1.00	1.15	1.35	1.50
1 hr	1.10	1.35	1.61	1.85	2.15	2.60	2.98
2 hr	1.34	1.66	2.00	2.34	2.70	3.26	3.76
3 hr	1.50	1.86	2.28	2.67	3.09	3.69	4.29
6 hr	1.86	2.28	2.82	3.36	3.90	4.62	5.40
12 hr	2.28	2.76	3.48	4.20	4.92	5.76	6.72
24 hr	2.64	3.36	4.32	5.28	6.24	7.20	8.40

**FIGURE B-1**  
**NRCS (SCS) TYPE II RAINFALL DISTRIBUTION - S CURVE**

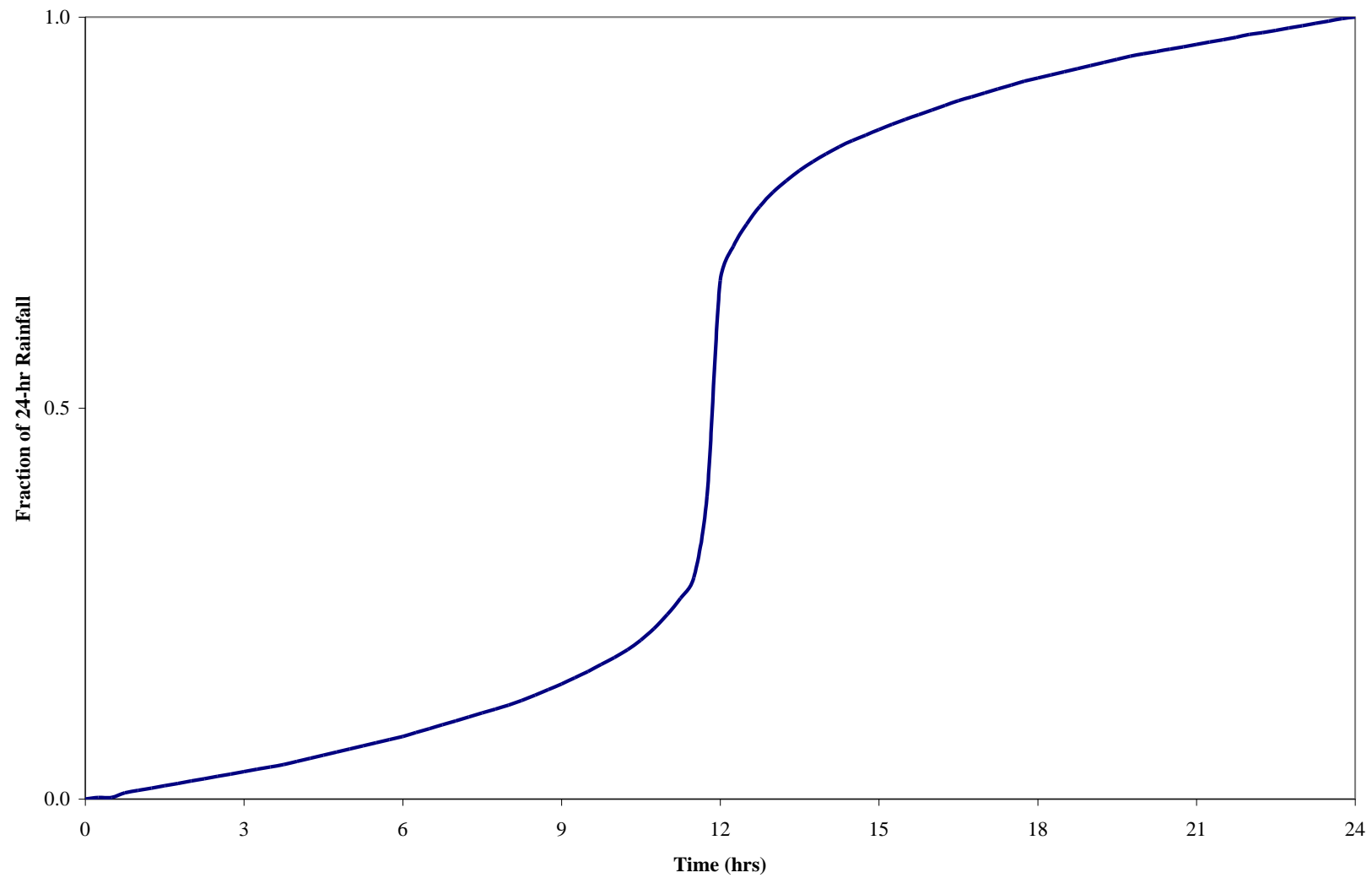
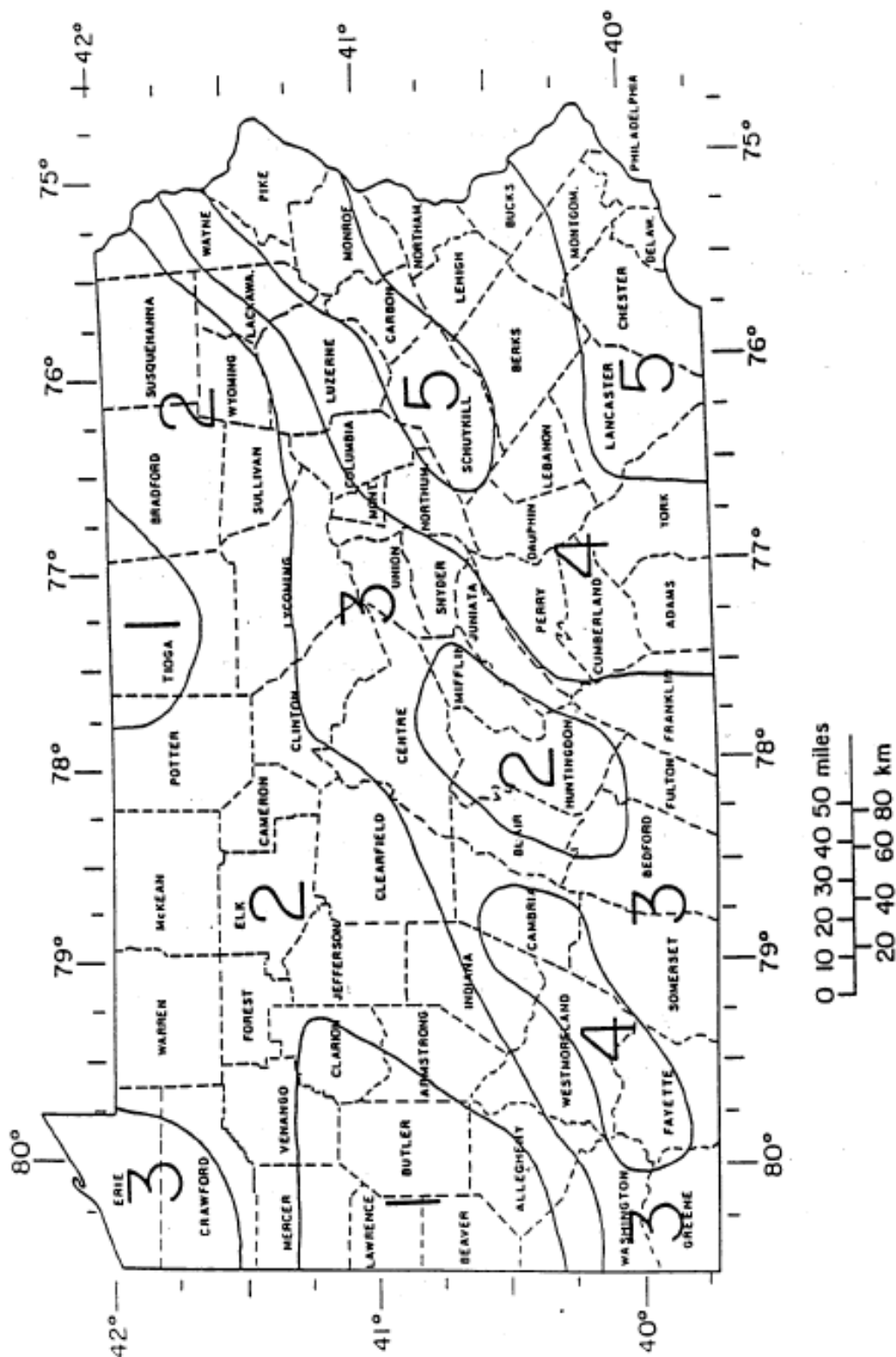
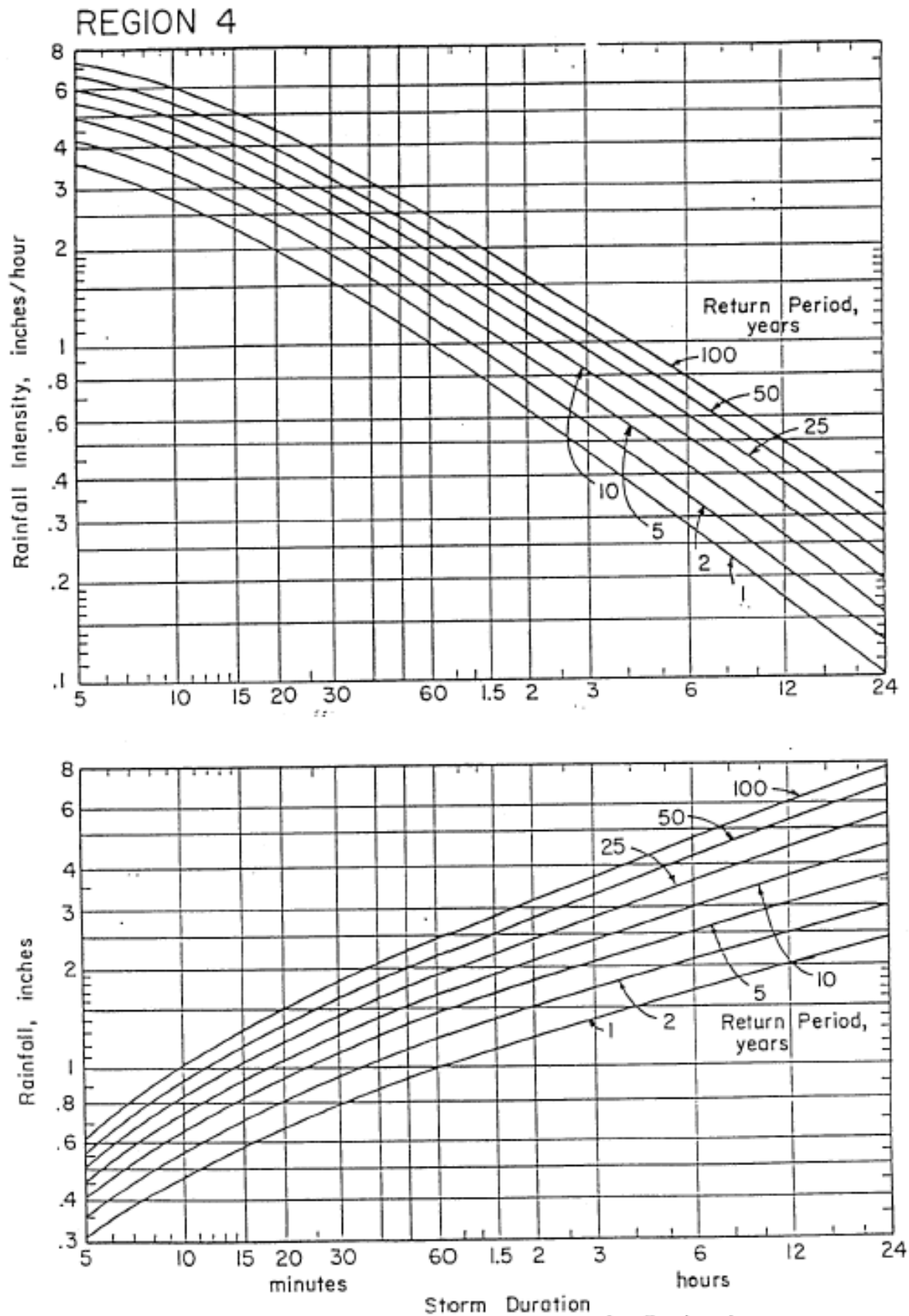


FIGURE B-2  
PENNDOT DELINEATED REGIONS

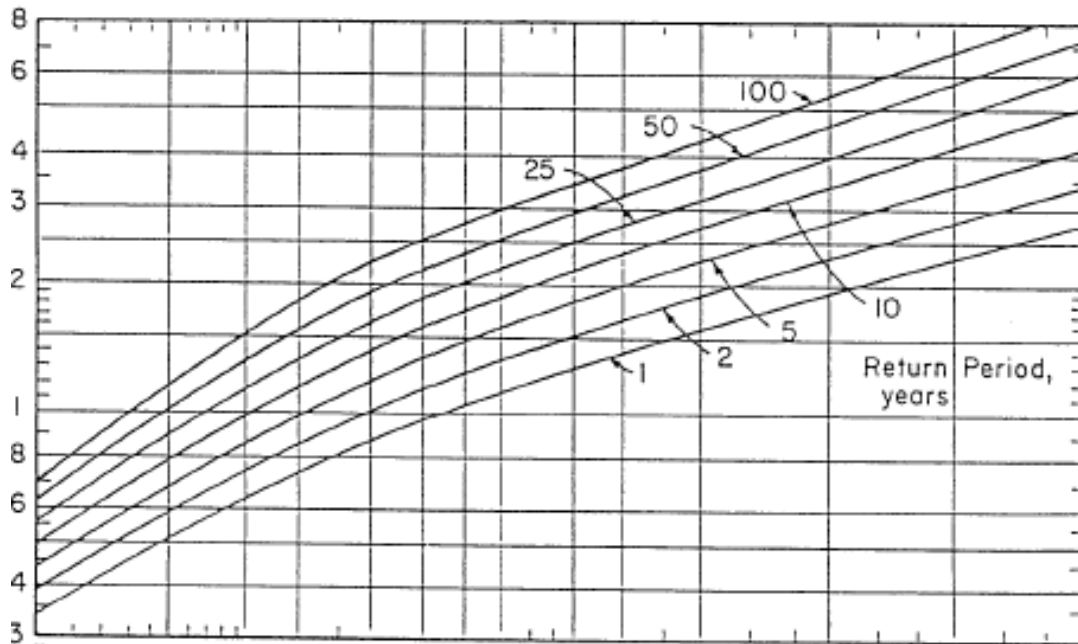
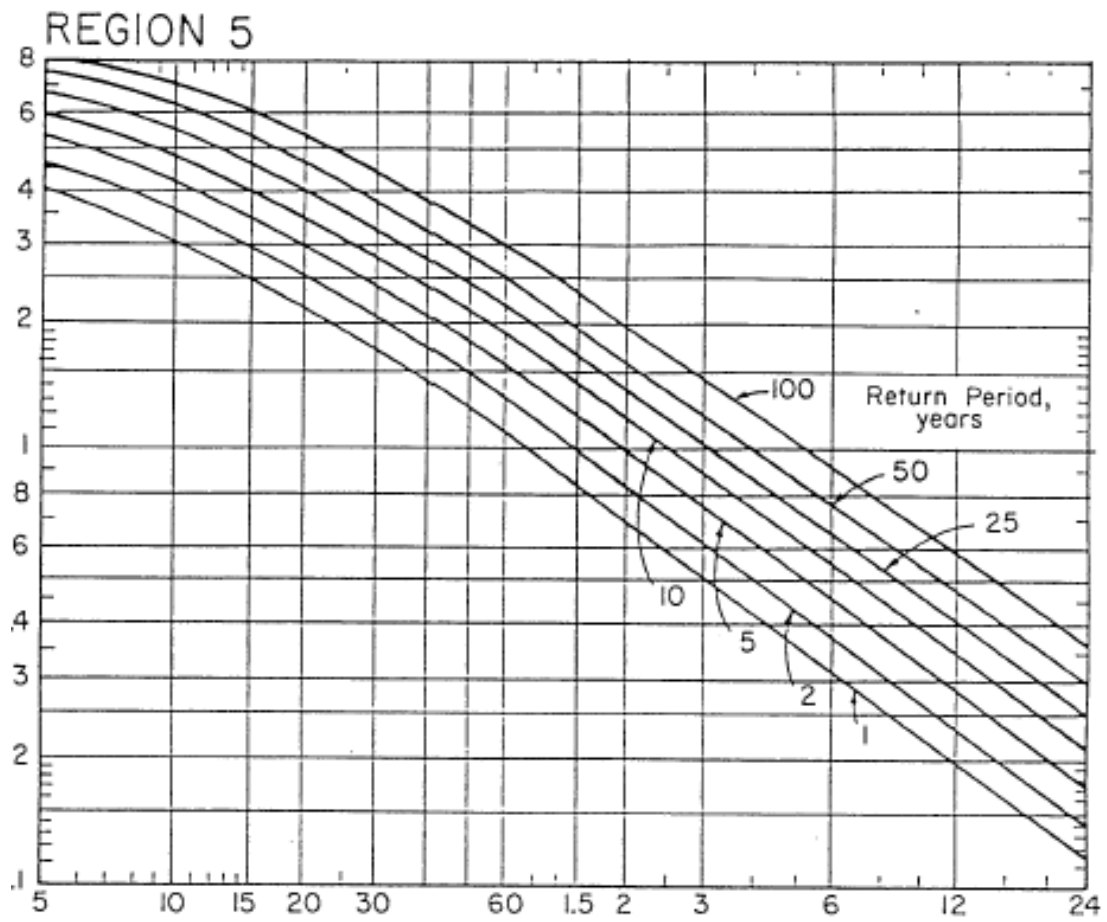


**FIGURE B-3**  
**PENNDOT STORM INTENSITY-DURATION-FREQUENCY CURVE**





**FIGURE B-4**  
**PENNDOT STORM INTENSITY-DURATION-FREQUENCY CURVE**



**TABLE B-2**  
**Runoff Curve Numbers**  
**(From NRCS (SCS) TR-55)**

LAND USE DESCRIPTION			HYDROLOGIC SOIL GROUP				
			Hydrologic Condition				
				A	B	C	D
Open Space							
	Grass cover < 50%	Poor		68	79	86	89
	Grass cover 50% to 75%	Fair		49	69	79	84
	Grass cover > 75%	Good		39	61	74	80
Meadow				30	58	71	78
Agricultural							
	Pasture, grassland, or range – Continuous forage for grazing	Poor		68	79	86	89
	Pasture, grassland, or range – Continuous forage for grazing.	Fair		49	69	79	84
	Pasture, grassland, or range – Continuous forage for grazing	Good		39	61	74	80
	Brush-brush-weed-grass mixture with brush the major element.	Poor		48	67	77	83
	Brush-brush-weed-grass mixture with brush the major element.	Fair		35	56	70	77
	Brush-brush-weed-grass mixture with brush the major element.	Good		30	48	65	73
Fallow	Bare soil	-----		77	86	91	94
	Crop residue cover (CR)	Poor		76	85	90	93
		Good		74	83	88	90
Woods – grass combination (orchard or tree farm)							
		Poor		57	73	82	86
		Fair		43	65	76	82
		Good		32	58	72	79
Woods							
		Poor		45	66	77	83
		Fair		36	60	73	79
		Good		30	55	70	77
Commercial	(85% Impervious)			89	92	94	95
Industrial	(72% Impervious)			81	88	91	93
Institutional	(50% Impervious)			71	82	88	90
Residential districts by average lot size:							
			% Impervious				
1/8 acre or less (town houses)		65		77	85	90	92
1/4 acre		38		61	75	83	87

1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Farmstead		59	74	82	86
Smooth Surfaces (Concrete, Asphalt, Gravel or Bare Compacted Soil)		98	98	98	98
Water		98	98	98	98
Mining/Newly Graded Areas (Pervious Areas Only)		77	86	91	94

\* Includes Multi-Family Housing unless justified lower density can be provided.

**Note:** Existing site conditions of bare earth or fallow ground shall be considered as meadow when choosing a CN value.

**TABLE B-3**  
**RATIONAL RUNOFF COEFFICIENTS**

	HYDROLOGIC SOIL GROUP			
LAND USE DESCRIPTION	A	B	C	D
Cultivated Land : without conservation treatment	.49	.67	.81	.88
: with conservation treatment	.27	.43	.61	.67
Pasture or range land : poor condition	.38	.63	.78	.84
: good condition	---*	.25	.51	.65
Meadow : good condition	---*	---*	.44	.61
Wood or Forest Land : thin stand, poor cover, no mulch	---*	.34	.59	.70
: good cover	---*	---*	.45	.59
Open Spaces, lawns, parks, golf courses, cemeteries				
Good condition : grass cover on 75% or more of the area	---*	.25	.51	.65
Fair condition : grass cover on 50% to 75% of the area	---*	.45	.63	.74
Commercial and business areas (85% impervious)	.84	.90	.93	.96
Industrial districts (72% impervious)	.67	.81	.88	.92
Residential :				
Average lot size      Average % Impervious				
1/8 acre or less      65	.59	.76	.86	.90
1/4 acre      38	.25	.49	.67	.78
1/3 acre      30	---*	.49	.67	.78
1/2 acre      25	---*	.45	.65	.76
1 acre      20	---*	.41	.63	.74
Paved parking lots, roofs, driveways, etc.	.99	.99	.99	.99
Streets and roads :				
Paved with curbs and storm sewers	.99	.99	.99	.99
Gravel	.57	.76	.84	.88
Dirt	.49	.69	.80	.84

Notes : Values are based on S.C.S. definitions and are average values.  
Values indicated by “---“ should be determined by the design engineer based on site characteristics.

Source : New Jersey Department of Transportation, Technical Manual for Stream Encroachment,  
August, 1984 (60)

## Roughness Coefficients (Manning's "n") For Overland Flow (U.S. Army Corps Of Engineers, HEC-1 Users Manual)

## Roughness Coefficients (Manning's “n”) For Channel Flow

- (1) Depending upon type, coating and diameter
- (2) Values recommended by the American Concrete Pipe Association, check Manufacturer's recommended value.

**TABLE B-5**

**24-Hour Storm Values Representing 90 % of Annual Rainfall**

PennDOT Rainfall Region	P Inches
1	1.13
2	1.48
3	1.60
4	1.95
5	2.04

**TABLE B-6**  
**Nonstandard Stormwater Management**  
**Stormwater Credits for Computing Proposed conditions Hydrograph**

The developer may, subject to approval of the municipal engineer, use the stormwater credits, described in the following table, in computing proposed conditions hydrograph:

<b>Nonstructural Stormwater Measure</b>	<b>Description</b>
Natural Area Conservation	Conservation of natural areas such as forest, wetlands, or other sensitive areas in a protected easement thereby retaining their existing hydrologic and water quality characteristics.
Disconnection of Rooftop Runoff	Rooftop runoff is disconnected and then directed over a pervious area where it may either infiltrate into the soil or filter over it. This is typically obtained by grading the site to promote overland flow or by providing bioretention on single-family residential lots.
Disconnection of Non-Rooftop Runoff	Disconnect surface impervious cover by directing it to pervious areas where it is either infiltrated or filtered through the soil.
Buffers	Buffers effectively treat stormwater runoff. Effective treatment constitutes capturing runoff from pervious and impervious areas adjacent to the buffer and treating the runoff through overland flow across a grass or forested area.
Grass Channel (Open Section Roads)	Open grass channels are used to reduce the volume of runoff and pollutants during smaller storms.
Environmentally Sensitive Rural Development	Environmental site design techniques are applied to low density or rural residential development.

## ORDINANCE APPENDIX C

### SAMPLE DRAINAGE PLAN APPLICATION AND FEE SCHEDULE

(To be attached to the "land subdivision plan or development plan review application or "minor land subdivision plan review application")

Application is hereby made for review of the Stormwater Management and Erosion and Sedimentation Control Plan and related data as submitted herewith in accordance with the \_\_\_\_\_ Township Stormwater Management and Earth Disturbance Ordinance.

\_\_\_\_\_ Final Plan \_\_\_\_\_ Preliminary Plan \_\_\_\_\_ Sketch Plan

Date of Submission \_\_\_\_\_ Submission No. \_\_\_\_\_

1. Name of subdivision or development \_\_\_\_\_

2. Name of Applicant \_\_\_\_\_ Telephone No. \_\_\_\_\_

(if corporation, list the corporation's name and the names of two officers of the corporation)

\_\_\_\_\_ Officer 1

\_\_\_\_\_ Officer 2

Address \_\_\_\_\_

Zip \_\_\_\_\_

Applicants interest in subdivision or development

(if other than property owner give owners name and address)

3. Name of property owner \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_

Zip \_\_\_\_\_

4. Name of engineer or surveyor \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_

Zip \_\_\_\_\_

5. Type of subdivision or development proposed:

_____ Single-Family Lots	_____ Townhouses	_____ Commercial(Multi-Lot)
_____ Two Family Lots	_____ Garden Apartments	_____ Commercial (One-Lot)
_____ Multi-Family Lots	_____ Mobile-Home Park	_____ Industrial (Multi-Lot)
_____ Cluster Type Lots	_____ Campground	_____ Industrial (One-Lot)
_____ Planned Residential Development	_____ Other (_____)	

(64)



6. Lineal feet of new road proposed \_\_\_\_\_ L.F.

7. Area of proposed and existing conditions impervious area on entire tract.

- a. Existing (to remain) \_\_\_\_\_ S.F. \_\_\_\_\_ % of Property  
b. Proposed \_\_\_\_\_ S.F. \_\_\_\_\_ % of Property

8. Stormwater

a. Does the peak rate of runoff from proposed conditions exceed that flow which occurred for existing conditions for the designated design storm? \_\_\_\_\_

b. Design storm utilized (on-site conveyance systems) (24 hr.) \_\_\_\_\_  
No. of Subarea \_\_\_\_\_  
Watershed Name \_\_\_\_\_

Explain: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

c. Does the submission and/or district meet the release rate criteria for the applicable subarea? \_\_\_\_\_

d. Number of subarea(s) from Ordinance Appendix D of the Brodhead and McMichaels Creek Watershed Stormwater Management Plan. \_\_\_\_\_

e. Type of proposed runoff control \_\_\_\_\_

f. Does the proposed stormwater control criteria meet the requirement/guidelines of the Stormwater Ordinances? \_\_\_\_\_

If not, what variances/waivers are requested? \_\_\_\_\_  
\_\_\_\_\_

Reasons \_\_\_\_\_

g. Does the plan meet the requirements of Article iii of the Stormwater Ordinances? \_\_\_\_\_

If not, what variances/waivers are requested? \_\_\_\_\_

Reasons Why \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

h. Was TR-55, June 1986 utilized in determining the time of concentration? \_\_\_\_\_  
\_\_\_\_\_

i. What hydrologic method was used in the stormwater computations? \_\_\_\_\_  
\_\_\_\_\_

- j. Is a hydraulic routing through the stormwater control structure submitted? \_\_\_\_\_  
\_\_\_\_\_
- k. Is a construction schedule or staging attached? \_\_\_\_\_
- l. Is a recommended maintenance program attached? \_\_\_\_\_
9. Erosion and Sediment Pollution Control (E&S):
- a. Has the stormwater management and E&S plan, supporting documentation and narrative been submitted to the \_\_\_\_\_ [County Name] \_\_\_\_\_ County Conservation District? \_\_\_\_\_
- b. Total area of earth disturbance \_\_\_\_\_ S.F.
10. Wetlands
- a. Have the wetlands been delineated by someone trained in wetland delineation? \_\_\_\_\_
- b. Have the wetland lines been verified by a state or federal permitting authority? \_\_\_\_\_
- c. Have the wetland lines been surveyed? \_\_\_\_\_
- d. Total acreage of wetland within the property \_\_\_\_\_
- e. Total acreage of wetland disturbed \_\_\_\_\_
- f. Supporting documentation \_\_\_\_\_
11. Filing
- a. Has the required fee been submitted? \_\_\_\_\_  
Amount \_\_\_\_\_
- b. Has the proposed schedule of construction inspection to be performed by the Applicant's engineer been submitted? \_\_\_\_\_
- c. Name of individual who will be making the inspections \_\_\_\_\_
- d. General comments about stormwater management at the development \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COMMONWEALTH OF PENNSYLVANIA  
COUNTY OF [County Name].

\_\_\_\_\_  
Property Owner

THE UNDERSIGNED HEREBY CERTIFIES THAT TO THE BEST OF HIS KNOWLEDGE AND BELIEF THE INFORMATION AND STATEMENTS GIVEN ABOVE ARE TRUE AND CORRECT.

////////////////////////////////////

\_\_\_\_\_ (Name of) Municipality official submission receipt:

Fees \_\_\_\_\_ date fees paid \_\_\_\_\_ received by \_\_\_\_\_

Official submission receipt date \_\_\_\_\_

Received by \_\_\_\_\_

Municipality

# **Drainage Plan Proposed Schedule Of Fees**

Subdivision name \_\_\_\_\_ Submittal No. \_\_\_\_\_

Owner \_\_\_\_\_ Date \_\_\_\_\_

Engineer \_\_\_\_\_

- |   |          |
|---|----------|
| 1. Filing fee   | \$ _____ |
| 2. Land use   |          |
| 2a. Subdivision, campgrounds, mobile home parks, and multi-family dwelling where the units are located in the same local watershed. | \$ _____ |
| 2b. Multi-family dwelling where the designated open space is located in a different local watershed from the proposed units.        | \$ _____ |
| 2c. Commercial/industrial.  | \$ _____ |
| 3. Relative amount of earth disturbance   |          |
| 3a. Residential   |          |
| road <500 l.f.  | \$ _____ |
| road 500-2,640 l.f.   | \$ _____ |
| road >2,640 l.f.  | \$ _____ |
| 3b. Commercial/industrial and other   |          |
| impervious area <3,500 s.f.   | \$ _____ |
| impervious area 3,500-43,460 s.f.   | \$ _____ |
| impervious area >43,560 s.f.  | \$ _____ |
| 4. Relative size of project   |          |
| 4a. Total tract area <1 ac  | \$ _____ |
| 1-5 ac  | \$ _____ |
| 5-25 ac   | \$ _____ |
| 25-100 ac   | \$ _____ |
| 100-200 ac  | \$ _____ |
| >200 ac   | \$ _____ |
| 5. Stormwater control measures  |          |
| 5a. Detention basins & other controls which require a review of hydraulic routings (\$ per control).                                | \$ _____ |
| 5b. Other control facilities which require storage volume calculations but no hydraulic routings. ( \$ per control)                 | \$ _____ |
| 6. Site inspection (\$ per inspection)  | \$ _____ |
| Total   | \$ _____ |

All subsequent reviews shall be 1/4 the amount of the initial review fee unless a new application is required as per Section 406 of the stormwater ordinance. A new fee shall be submitted with each revision in accordance with this schedule.

**ORDINANCE APPENDIX D**  
**STORMWATER MANAGEMENT DISTRICT WATERSHED MAP**

# ORDINANCE APPENDIX E

## West Nile Virus Guidance

### **Monroe County Conservation District Guidance: Stormwater Management and West Nile Virus**

The Monroe County Conservation District recognizes the need to address the problem of non-point source pollution impacts caused by runoff from impervious surfaces. The new stormwater policy being integrated into Act 167 Stormwater Management regulations by the PA Department of Environmental Protection (DEP) will make non-point pollution controls an important component of all future plans and updates to existing plans. In addition, to meet post-construction anti-degradation standards under the state National Pollution Discharge Elimination System (NPDES) permitting program, applicants will be required to employ Best Management Practices (BMPs) to address non-point pollution concerns.

Studies conducted throughout the United States have shown that wet basins and in particular constructed wetlands are effective in traditional stormwater management areas such as channel stability and flood control, and are one of the most effective ways to remove stormwater pollutants (United States Environmental Protection Agency 1991, Center for Watershed Protection 2000). From Maryland to Oregon, studies have shown that as urbanization and impervious surface increase in a watershed, the streams in those watersheds become degraded (CWP 2000). Although there is debate over the threshold of impervious cover when degradation becomes apparent (some studies show as little as 6% while others show closer to 20%), there is agreement that impervious surfaces cause nonpoint pollution in urban and urbanizing watersheds, and that degradation is ensured if stormwater BMPs are not implemented.

Although constructed wetlands and ponds are desirable from a water quality perspective there may be concerns about the possibility of these stormwater management structures becoming breeding grounds for mosquitoes. The Conservation District feels that although it may be a valid concern, **municipalities should not adopt ordinance provisions prohibiting wet basins for stormwater management.**

### **Mosquitoes**

The questions surrounding mosquito production in wetlands and ponds have intensified in recent years by the outbreak of the mosquito-borne West Nile Virus. As is the case with all vector-borne maladies, the life cycle of West Nile Virus is complicated, traveling from mosquito to bird, back to mosquito and then to other animals including humans. *Culex pipiens* was identified as the vector species in the first documented cases from New York in 1999. This species is still considered the primary transmitter of the disease across its range. Today there are some 60 species of mosquitoes that inhabit Pennsylvania. Along with *C. pipiens*, three other species have been identified as vectors of West Nile Virus while four more have been identified as potential vectors.

The four known vectors in NE Pennsylvania are *Culex pipiens*, *C. restuans*, *C. salinarius* and *Ochlerotatus japonicus*. All four of these species prefer, and almost exclusively use, artificial containers (old tires, rain gutters, birdbaths, etc.) as larval habitats. In the case of *C. pipiens*, the most notorious of the vector mosquitoes, the dirtier the water the better they like it. The important factor is that these species do not thrive in functioning wetlands where competition for resources and predation by larger aquatic and terrestrial organisms is high.

The remaining four species, *Aedes vexans*, *Ochlerotatus Canadensis*, *O. triseriatus* and *O. trivittatus* are currently considered potential vectors due to laboratory tests (except the *O. trivittatus*, which did have one confirmed vector pool for West Nile Virus in PA during 2002). All four of these species prefer vernal habitats and ponded woodland areas following heavy summer rains. These species may be the greatest threat of disease transmission around stormwater basins that pond water for more than four days. This can be mitigated however by establishing ecologically functioning wetlands.

## **Stormwater Facilities**

If a stormwater wetland or pond is constructed properly and a diverse ecological community develops, mosquitoes should not become a problem. Wet basins and wetlands constructed as stormwater management facilities, should be designed to attract a diverse wildlife community. If a wetland is planned, proper hydrologic soil conditions and the establishment of hydrophytic vegetation will promote the population of the wetland by amphibians and other mosquito predators. In natural wetlands, predatory insects and amphibians are effective at keeping mosquito populations in check during the larval stage of development while birds and bats prey on adult mosquitoes.

The design of a stormwater wetland must include the selection of hydrophytic plant species for their pollutant uptake capabilities and for not contributing to the potential for vector mosquito breeding. In particular, species of emergent vegetation with little submerged growth are preferable. By limiting the vegetation growing below the water surface, larvae lose protective cover and there is less chance of anaerobic conditions occurring in the water.

Stormwater ponds can be designed for multiple purposes. When incorporated into an open space design a pond can serve as a stormwater management facility and a community amenity. Aeration fountains and stocked fish should be added to keep larval mosquito populations in check.

Publications from the PA Department of Health and the Penn State Cooperative Extension concerning West Nile Virus identify aggressive public education about the risks posed by standing water in artificial containers (tires, trash cans, rain gutters, bird baths) as the most effective method to control vector mosquitoes.

## **Conclusion**

The Conservation District understands the pressure faced by municipalities when dealing with multifaceted issues such as stormwater management and encourages the

incorporation of water quality management techniques into stormwater designs. As Monroe County continues to grow, conservation design, groundwater recharge and constructed wetlands and ponds should be among the preferred design options to reduce the impacts of increases in impervious surfaces. When designed and constructed appropriately, the runoff mitigation benefits to the community from these design options will far out weigh their potential to become breeding grounds for mosquitoes.



# **ORDINANCE APPENDIX F**

## **Consumptive Use Tracking**

## CONSUMPTIVE USE TRACKING REPORT

PROJECT NAME: \_\_\_\_\_ MUNICIPALITY: \_\_\_\_\_

Type of Project:    ☐ Residential    ☐ Commercial    ☐ Institutional  
                                  ☐ Recreational/Seasonal                      ☐ Industrial

1. In which watershed is this project located? If more than one, identify the percentage of the project in each watershed. (See Figure x.x.)

- \_\_\_ Appenzell
- \_\_\_ Brodhead – above Paradise
- \_\_\_ Brodhead – below Paradise
- \_\_\_ Marshalls
- \_\_\_ McMichael
- \_\_\_ Paradise
- \_\_\_ Pocono

- ## 2. Water Source

\_\_\_ On-Site Well    \_\_\_ Central (source watershed: \_\_\_\_\_)  
(utility company: \_\_\_\_\_)

- ### 3. Sewage Disposal

\_\_\_\_ Land Disposal                      \_\_\_\_ Stream Discharge

- #### 4. Stormwater

$$\frac{[\text{Required Infiltration}] * (\text{Proposed Infiltration})}{1.6728} = \text{Net Stormwater (gallons/day)}$$

5. **Water Use** (*Industrial projects must use project-specific data, not App. J or Table x.x.*)

A. \_\_\_\_\_ x \_\_\_\_\_ gallons/unit/day = \_\_\_\_\_ gallons/day  
 (# of Units Proposed) (Value from App. J) (Gross Water Use)

B. \_\_\_\_\_ gallons/day x \_\_\_\_\_ = \_\_\_\_\_ gallons/day  
(Gross Water Use) (Table x.x Multiplier)(Water Use)

- ## 6. Consumptive Use

$$\frac{\text{_____ gallons/day}}{\text{(Stormwater)}} + \frac{\text{_____ gallons/day}}{\text{(Water Use)}} = \frac{\text{_____ gallons/day}}{\text{(Consumptive Use)}}$$

\*Calculated per Section 304

## 7. Example

### 10-Lot Subdivision with On-Site Wells and Central Sewage

Stormwater: -420 gal/day (calculated per Section 304)

Water Use: 10 units x 190 gal/unit/day = 1900 gal/day  
1900 gal/day x 1.00 = 1900 gal/day

Consumptive Use: -420 gal/day + 1900 gal/day = 1480 gal/day

\*\*\*\*\*

Table x.x. Multipliers for Water Use Calculation (*Do not use for industrial projects.*)

Sewage Disposal		Central Out of Watershed	Central Within Watershed	On-Site Well
	Land Disposal	0	0.14	0.14
	Stream Discharge	0	1.00	1.00

Water Source

NOTES: A multiplier of 0 will result in a debit to the source watershed *by the reviewing entity*. A multiplier of 0.14, derived from the Pocono Creek Goal-Based Watershed Management Project, is designed to protect aquatic habitat during summer low flows. A multiplier of 1.00 assumes that water is not available to sustain aquatic base flows.

WATER USE FOR CONSUMPTIVE USE TRACKING		
TYPE OF ESTABLISHMENT	UNIT	GALLONS/UNIT/DAY
<b>Residential</b>		
Hotels and motels	Room	100
Multiple family dwellings and apartments, including townhouses, duplexes and condominiums	Unit	400
Rooming houses	Room	200
Residential Subdivisions (On-Lot Sewage)	Single family residences	400*
+Residential Subdivisions (Central Sewage)	Single family residences	190
*For units of 3 bedrooms or less; for each bedroom	over 3, add 100 gallons	
<b>Commercial</b>		
Airline catering	Meal served	3
Airports - not including food	Passenger	5
Airports	Employee	10
>Barber shops	Chair	54.6
One licensed operator beauty shops	Station	200
>Bowling alleys	Alley	133
Bus service areas - not including food	Patron and employee	5
>Bus/rail depots	Square foot	3.33
>Car washes	Inside square foot	4.78
Country clubs - not including food	Patron and employee	30
>Drive-in restaurants	Car stall	109
Drive-in theaters - not including food	Space	10
Factories and plants exclusive of industrial wastes	Employee	35
Laundries, self-service	Washer	400
>Laundries, non self-service	Square foot	0.25
>Medical Offices	Square foot	0.62
Mobile home parks, independent	Space	400
Movie theaters - not including food	Auditorium seat	5
>Night clubs	Person served	1.33
>Office buildings	Square foot	0.19
Offices	Employee	10
Restaurants (toilet and kitchen wastes)	Patron	10
Restaurants (additional for bars and cocktail lounges)	Patron	2
Restaurants (kitchen and toilet wastes, single-service utensils)	Person	8.5
Restaurants (kitchen waste only, single-service utensils)	Patron	3
>Service stations	Inside square foot	3.33
Stores	Public toilet	400
Warehouses	Employee	35

Work or construction camps (semipermanent) with flush Toilets	Employee	50
Work or construction camps (semipermanent) w/o flush Toilets	Employee	35
<b>TYPE OF ESTABLISHMENT</b>	<b><u>UNIT</u></b>	<b><i>GALLONS/UNIT/DAY</i></b>
<b>Institutional</b>		
Churches	Seat	3
Churches (additional kitchen waste)	Meal served	3
Churches (additional with paper service)	Meal served	1.5
Hospitals, with laundry	Bed space	300
Hospitals, without laundry	Bed space	220
Institutional food service	Meal	20
Institutions other than hospitals	Bed space	125
Schools, boarding	Resident	100
Schools, day (without cafeterias, gyms or showers)	Student & employee	15
Schools, day (with cafeterias, but no gyms or showers)	Student & employee	20
Schools, day (with cafeterias, gym and showers)	Student & employee	25
>YMCA/YWCA	Person	33.3
<b>Recreational and Seasonal</b>		
Camps, day (no meals served)	Person	10
Camps, hunting and summer residential (night and day) with limited plumbing including water-carried toilet wastes	Person	50
Campgrounds with individual sewer and water hookup	Space	100
Campgrounds with water hookup only and/or central comfort	Space	50
Station which includes water-carried toilet wastes		
Fairgrounds and parks, picnic - with bathhouses, showers and flush toilets	Person	15
Fairgrounds and parks, picnic - toilet wastes only	Person	5
Swimming pools and bathhouses	Person	10

NOTE: If type of establishment proposed is not listed or if more project specific values are available, supporting documentation must be provided.

SOURCE: PA Title 25§73.17. Sewage flows, unless otherwise indicated

> Crews, James E. and MaryAnn Miller, 1983. Forecasting Municipal and Industrial Water Use.

IWR Research Report 83R-3. U.S. Army Corps of Engineers, Fort Belvoir, Virginia.

+ Watershed Protection Advisory Committee Meeting #3 held at Monroe County Public Safety Center  
May 16, 2003.

**ORDINANCE APPENDIX G**  
**Selected Wetland BMP References**

**Ordinance Appendix H  
DEP Levee Data**

**Ordinance Appendix I**  
**Sample Optional Buffer Provision (Section 303.I)**



## **Buffer Requirements for Aquatic Resources to Maintain Water Quality**

### **Purpose/Justification**

There is a growing body of knowledge that has established the scientific basis for buffers around wetlands, vernal ponds, and lakes and along streams, to offset the impacts of development on water quality. The utility of buffers as a nonstructural BMP has been well-documented and in every case the retention of vegetated buffers have demonstrated positive water quality benefits. Nonstructural BMPs, like vegetated buffers, have several advantages over structural controls. Chief among these are allowing natural processes to renovate nonpoint source pollution. Nonstructural controls require little or no maintenance, while structural controls require routine maintenance. An analysis of existing stormwater management structures, conducted as part of the Paradise Creek Watershed Assessment and Protection Plan project, found that 80% of them were either constructed improperly or are failing due to lack of maintenance. In addition the use of buffers as nonstructural stormwater management tools will also allow for the green infrastructure identified in all of the Regional Open Space plans developed in the last five years. The purpose is to establish buffer requirements for new development that will ensure that antidegradation standards are met in the special protection waters of the Brodhead Creek and McMichaels Creek watersheds.

The width of the buffer is determinant upon a great deal of factors, including soil type, slope, existing vegetative cover, existing land use and proposed land use. Given all the parameter considerations necessary to determine a site-specific buffer, a fixed buffer including inner and outer zones established by the municipality to meet the intent of antidegradation in special protection waters, gives plan designers a standard option to adequately renovate stormwater runoff. This standard buffer can be applied throughout the watersheds and remediate runoff from most land uses and environmental site conditions.

Another option for the establishment of buffers to meet the water quality and stream bank erosion goals of this ordinance is to determine site-specific buffers as outlined in Section 303.I.3

### **303.I Buffer Requirements**

**1. There are two options for determining buffers. A project designer may propose a standard buffer, for streams, wetlands, vernal ponds and lakes in Section 303.I.2, or a site-specific buffer for streams, wetlands and vernal ponds in Section 303.I.3.**

- a. Where resource buffers overlap, the more restrictive requirements shall apply.
- b. Pre-existing Lots or Parcels/Development in Outer Buffers - In the case of legally pre-existing lots or parcels (approved prior to the effective date of this ordinance) where the useable area of a lot or parcel lies within an outer buffer area, rendering the lot or parcel unable to be developed in accordance with the allowable use per municipal zoning, the development may only be permitted by variance as provided in Section \_\_\_\_\_ of the municipality's \_\_\_\_\_ ordinance.

c. Improvements to Existing Structures in Outer Buffers - The provisions of this section do not require any changes or improvements to be made to lawfully existing structures in buffers. However, when any substantial improvement to a structure is proposed which results in a horizontal expansion of that structure, the improvement may only be permitted by variance as provided in Section \_\_\_\_\_ of the municipality's \_\_\_\_\_ ordinance.

d. Existing Land Use Considerations

i. When the existing condition within any portion of a buffer is an impervious surface such as a parking lot or roof top, then water quality BMPs must be implemented to remediate the impacts of existing runoff.

ii. The project designer should meet with the municipality or its designee to discuss the most appropriate BMP for the site. BMPs should be site specific, taking into consideration the land use change, type of potential pollutant loadings, soils and slope.

iii. If buffer restoration is a proposed BMP, the model developed by the U.S. Department of Agriculture Forest Service should be used as a guide with site-specific considerations used in determining total buffer width (see Appendix H).

## **2. Standard Buffers For Water Quality**

### **a. Wetlands and Vernal Ponds**

i. Wetland Identification – wetlands shall be identified in accord with the 1987 U.S. Army Corps of Engineers Manual for Identifying and Delineating Wetlands, as amended, and properly flagged and surveyed on site.

(1) Wetlands in an artificial watercourse – wetlands contained within the banks of an artificial watercourse shall not to be considered for buffer delineation purposes.

(2) Wetlands in a natural watercourse – where wetlands are contained within a the banks of a natural watercourse, only the stream buffer shall apply.

ii. Wetland and Vernal Pond Buffer Delineation – A \_\_\_\_\_foot inner buffer and \_\_\_\_\_foot outer buffer, measured perpendicular to and horizontally from the edge of the delineated wetland or vernal pond for a total distance of \_\_\_\_\_feet, shall be maintained for all wetlands and vernal ponds.

(1) Inner Buffer – Measured perpendicular to and horizontally from the edge of the delineated wetland or vernal pond, for a distance of \_\_\_\_\_feet.

(a) Stormwater conveyance required by the Township/Borough, buffer maintenance and restoration, the correction of hazardous conditions, wetland crossings permitted by DEP and passive unpaved stable trails

shall be permitted. No other earth disturbance, grading, filling, buildings, structures, new construction, or development shall be permitted.

(b) The area of the inner buffer altered by activities permitted in accord with Section 303.I.2.a.ii(1)(a) shall be minimized to the greatest extent practicable.

(2) Outer Buffer – Measured perpendicular to and horizontally from the outer edge of the inner buffer for a distance of \_\_\_\_\_feet.

(a) Provided no buildings are constructed, stormwater conveyance required by the Township/Borough, buffer maintenance and restoration, the correction of hazardous conditions, wetland crossings permitted by DEP, parking lots constructed to existing grade, roads constructed to existing grade, stable trails, and limited forestry activities that do not clear cut the buffer (e.g. selective regeneration harvest) in accord with a forestry management plan shall be permitted.

(b) No more than twenty (20) percent of the cumulative outer buffer on the subject parcel shall be altered by the activities permitted in accord with Section 303.I.2.a.ii(2)(a) above.

#### **b. Lakes and Ponds**

i. There is no outer buffer around lakes and ponds.

ii. Lake and Pond Buffer Delineation – A \_\_\_\_\_foot buffer measured perpendicular to and horizontally from the edge of any lake or pond, shall be maintained.

iii. Permitted Activities/Development - Stormwater conveyance required by the Township/Borough, buffer maintenance and restoration, the correction of hazardous conditions, lake front views, boat docks and passive unpaved stable trails shall be permitted provided no buildings are involved.

iv. No more than thirty-five (35) percent of the cumulative pond or lake buffer on the subject parcel shall be altered by the activities permitted in accord with Section 303.I.2.b.iii above.

#### **c. Streams**

i. Stream Buffer Delineation - A \_\_\_\_\_foot inner buffer and \_\_\_\_\_foot outer buffer, measured perpendicular to and horizontally from the top-of-bank on both sides of any stream, for a total distance of \_\_\_\_\_feet, shall be maintained. See Figure 303-1.

(1) Inner Buffer – Measured perpendicular to and horizontally from the top-of-bank of the stream for a distance of \_\_\_\_\_feet.

(a) Stormwater conveyance required by the Township/Borough, buffer maintenance and restoration, the correction of hazardous conditions, stream crossings permitted by DEP, fish hatcheries, wildlife sanctuaries and boat launch sites constructed so as not to alter the flood plain cross section, and passive unpaved stable trails shall be permitted provided no buildings are constructed. No other earth disturbance, grading, filling, buildings, structures, new construction, or development shall be permitted.

(b) The area of the inner buffer altered by activities permitted in accord with Section 303.I.2.c.i(1)(a) shall be minimized to the greatest extent practicable.

(2) Outer Buffer – Measured perpendicular to and horizontally from the outer edge of the inner buffer for a distance of \_\_\_\_\_feet.

(a) Provided no buildings are constructed, stormwater conveyance required by the Township/Borough, buffer maintenance and restoration, the correction of hazardous conditions, agricultural activities, plant nurseries, parking lots constructed to existing grade, temporary fairs and carnivals, accessory uses for residential purposes, private sportsmen's club activities, athletic facilities, orchards, wildlife sanctuaries, boat launch sites that do not alter the flood plain cross section, fish hatcheries, stream crossings permitted by DEP and passive unpaved stable trails, and limited forestry activities that do not clear cut the buffer (e.g. selective regeneration harvest) in accord with a forestry management plan shall be permitted.

(b) In areas of the outer buffer which are not wetlands, vernal ponds or slopes of more than fifteen (15) percent, stormwater management facilities which improve water quality of stormwater discharge shall be permitted unless prohibited by other Township/Borough or state requirements. No other earth disturbance, grading, filling, buildings, structures, new construction, or development shall be permitted.

(c) No more than twenty (20) percent of the cumulative outer buffer on the subject parcel shall be altered by the activities permitted in accord with Section 303.I.2.c.i.(2)(a) above.

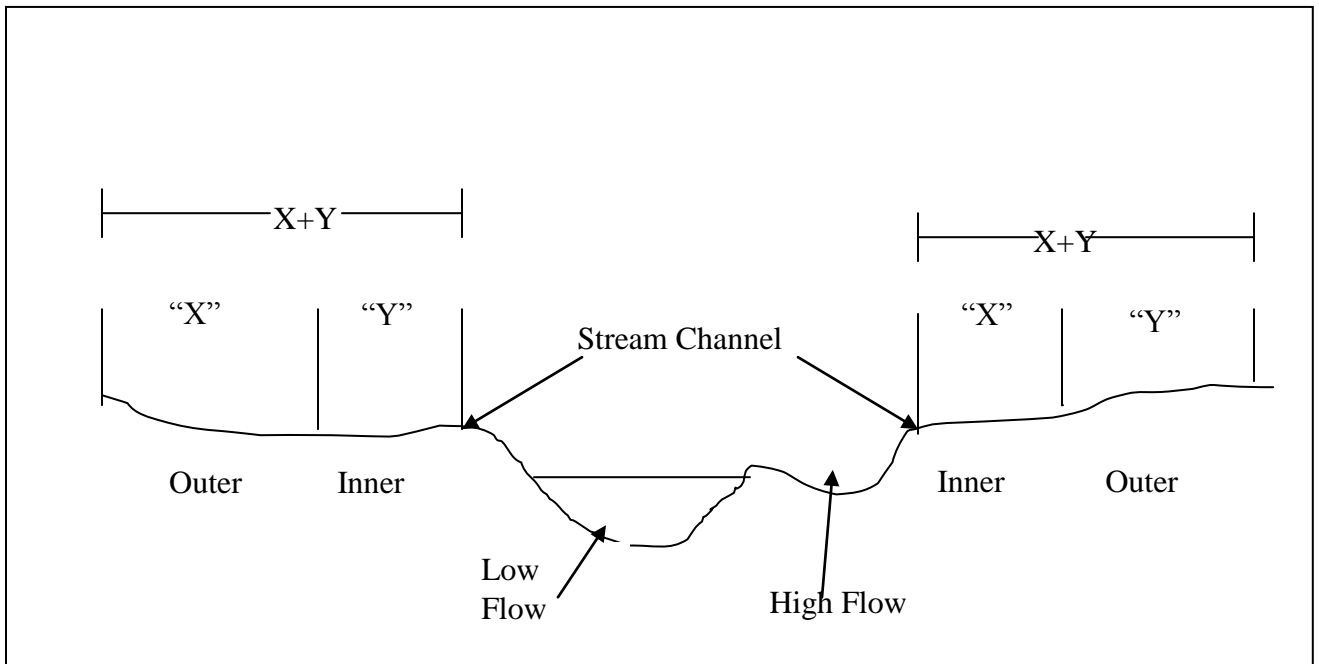


Figure 303-1. Standard Stream Buffer

**3. Where the applicant proposes to determine a site-specific buffer as discussed in Section 303.I.1, a detailed analysis of site conditions may be substituted for the standard buffer in Sections 303.I.2.a., 303.I.2.b. and 303.I.2.c. of this ordinance.**

a. The information needed to perform a detailed analysis must include, at a minimum, the following information.

- i. Contributing drainage area to the stream at the down slope discharge site of the project area.
- ii. Wetlands
- iii. Vernal ponds
- iv. Hydrologic soil groups (see Section 303I.3.c.ii.)
- v. Average percent slope adjacent to the stream, wetland or vernal pond (see Section 303.I.3.c.i.)

b. Contributing Drainage, Wetland Type and Vernal Pond Considerations

i. Wetlands in an artificial watercourse – wetlands contained within the banks of an artificial watercourse shall not to be considered for buffer delineation purposes.

ii. Wetlands in a natural watercourse – where wetlands are contained within a the banks of a natural watercourse, only the stream buffer shall apply

iii. A minimum fifty (50) foot buffer shall be maintained for the following resources:

- (1) Streams with a drainage area ten (10) square miles or greater
- (2) Perched wetlands

iv. A minimum seventy five (75) foot buffer shall be maintained for the following resources:

- (1) Streams with a drainage area less than ten (10) square miles
- (2) Non-perched wetlands
- (3) Vernal ponds

v. The only additional buffer is determined using the criteria in Section 303.I.3.c for site-specific conditions. If no additional buffer is required after site-specific analysis, only those activities listed under Section 303.I.2.a.ii.(1) or 303.I.2.c.i.(1) shall be allowed.

c. Any additional site-specific buffer shall be determined by applying the following criteria within the first one hundred and fifty (150) feet, measured perpendicular from the edge of any wetland or vernal pond, or the top-of-bank of either side of any stream. Existing impervious areas shall be excluded.

i. Within the 150-foot analysis area, a weighted average buffer shall be calculated based on the aerial extent of slopes and the following table:

Percent Slope	Additional Buffer
0% to <4%	None
4% to <15%	25 feet
15% to <25%	50 feet
≥ 25%	100 feet

ii. Within the 150-foot analysis area, a weighted average buffer shall be calculated based on the aerial extent of hydrologic soil group coverage and the following table:

Hydrologic Soil Group	Additional Buffer
A	None
B	15 feet
C	25 feet
D	50 feet

iii. The additional buffers calculated in Section 303.I.3.c shall be added to the minimum buffer determined in accord with Section 303.I.3.b.

d. Once the site-specific buffer has been established, it shall be divided into two areas, a fifty (50) foot inner buffer and an outer buffer consisting of the remainder of the buffer area. Inner and outer buffer restrictions are described in §303.I.2.a. for wetlands and vernal ponds and §303.I.2.c. for streams. See example in Appendix I.